

# AEROCOM

JOHN D. ODEGARD SCHOOL OF AEROSPACE SCIENCES

WINTER 2020



LEADING INTO  
**THE NEXT DECADE**

**UND**  
UNIVERSITY OF  
NORTH DAKOTA  
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# TABLE OF CONTENTS

- 04 Letter from the Dean
- 06 2019 Aerospace Hall of Fame
- 08 UAS Degree Program Reaches 10-year Anniversary
- 08 Simulators on Campus
- 12 Grad, Brett Whalin '11 Makes Most of his UAS Degree
- 14 On The Horizon
- 18 Building a Better Forecast in 'Blizzard Alley'
- 20 A New Paradigm for Forecasting Tornadoes
- 24 UND Positioned For Future Space Exploration
- 26 North Dakota Youth Reaching New Heights

## AEROCOM | WINTER 2020

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Happy 2020 from the John D. Odegard School of Aerospace Sciences!

As we begin a new decade at the Odegard School we certainly have an exciting future given the explosive growth in the Aviation industry, renewed focus on Space and Space Force (the newest branch of the Armed Services), increased societal concerns about severe weather as well as concerns about climate change and its effects on our planet. The Odegard School's four academic departments—Atmospheric Sciences, Aviation, Earth Systems Science and Policy and Space Studies—are poised to provide the graduates necessary to meet the work force needs of society and to solve problems in each of these disciplines.

Some of the highlighted happenings at the Odegard School in recent months include the following:

In early January, we were pleased Senator Kevin Cramer brought four star General Raymond to campus for breakfast in Robin hall, a tour of the Odegard School complex and a town hall meeting with ROTC students and faculty, staff and students from across campus. It was a special day to host the General for his first public appearance since being named the Commander of Space Force and the first Chief of Space Operations. General Raymond was especially excited about coming to UND since he was stationed at Grand Forks AFB as a young Air Force officer and met his wife, Molly (a UND Alum) in Grand Forks. We look forward to exciting collaborations between the Space Force and the University of North Dakota—especially with our Space Studies department!

We were also fortunate to have Senator Cramer bring the new NASA Administrator to the UND campus in September—Administrator Jim Bridenstine. The Administrator was very impressed with the research the University is doing in collaboration with NASA as well as our long history of providing high quality graduates from our Space Studies Masters and Ph.D. programs for the NASA work force.

Dr. Kim Kenville received a special honor recently as she was appointed to a four year term by Secretary of Transportation Elaine Chou to the National Academy of Sciences' Airport Cooperative Research Program Oversight Committee. Congratulations Dr. Kenville on this very special recognition!

The Odegard School Pathway programs for our graduates continue to expand not only with U.S. airlines, but internationally as well. In November we welcomed executives from Korean Airlines for the signing of our first international pathway program! This milestone is very impressive not only for the college, but for our increasing number of Korean students and another key factor recognizing our superb international reputation.

Dr. Mark Askelson was named the Odegard School Associate Dean for Research after an internal search was conducted during the Fall Semester. Congratulations Mark and we welcome you to our Leadership Team!

Finally, we look forward to hosting the start of the National Women's Air Race Classic from the Grand Forks Airport on June 19-23!

A special thank you to each of you for your great support of UND Aerospace! It is deeply appreciated by the faculty and staff as well as the students of the John D. Odegard School of Aerospace Sciences!

Have a great 2020!

**PAUL LINDSETH | DEAN, JOHN D. ODEGARD SCHOOL OF AEROSPACE SCIENCES**



# NEW DECADE NEW FLEET



# UND AEROSPACE

UNIVERSITY OF NORTH DAKOTA

## 2019 AEROSPACE HALL OF FAME

Four aviation leaders inducted into UND Aerospace Hall of Fame

Four distinguished UND alumni who've contributed immensely to the field of aviation were inducted into the UND Aerospace Hall of Fame on Oct. 4.

After being established last year, the UND Aerospace Hall of Fame awards have become an annual tradition at UND's John D. Odegard School of Aerospace Sciences. Last year's awards – the UND Aerospace Hall of Fame's first -- honored the 1985 UND Flying Team, the first at UND to win a national aviation championship; Karen Ruth '82, a distinguished Delta Airlines captain; and Roger Martin '73, who retired from Cessna as a senior executive after a 36-year career with the company.

The 2019 UND Aerospace Hall of Fame inductees were honored at the UND Aerospace 2019 Hall of Fame Luncheon, which was held during Homecoming Week on Friday, Oct. 4.

The 2019 inductees into the UND Aerospace Hall of Fame are:

### **Jim Bunke '78**

Bunke is regional vice president of Gulfstream Aerospace Corp. and a former senior executive with Bombardier Aerospace and Beechcraft Sales Inc./Raytheon

Aircraft Co., He has received the top sales award at Beechcraft, Raytheon and Bombardier, including the Olive Ann Beech Award and Salesman of the Year. He has served the Odegard School by sitting on all of the Dean's Search Committees to help in selecting the college's future leaders (1999 and 2016), and for decades has supported UND aviation students through an established Aviation Department scholarship.

### **Robert Muhs '77**

Muhs is director of aviation business consulting for The Boeing Co. He is a former senior vice president of operations at Pinnacle Airlines, a former vice president flight operations and system operations control for Delta Air Lines and a former vice president, system operations control for Northwest Airlines. He served on the U.S. Department of Transportation's National Task Force to develop model contingency plans to deal with lengthy airline on-ground delays and was instrumental in the successful merger of two of the world's largest Service Operations Centers – those belonging to Delta Air Lines and Northwest Airlines -- in 2009.

### **James Sweeney '86**

James Sweeney is co-founder and president of Fargo Jet Center – a fixed-base



operator or aviation services provider at Hector International Airport in Fargo, N.D. – and vice president of Weather Modification LLC, a Fargo-N.D.-based global atmospheric sciences company. In 2012, he was elected chairman of the National Air Transportation Association and was president of Fargo Jet Center when it was named the Fargo Moorhead West Fargo Chamber’s 2010 Business of the Year.

**Patrick Sweeney ‘78**

Patrick Sweeney – older brother of fellow 2019 UND Aerospace Hall of Fame Inductee James Sweeney -- is CEO of Weather Modification LLC and CEO of the Fargo Jet Center. He started at Weather Modification as a summer electronics radar technician in 1975 and rose through the ranks, serving as director of electronics, vice president and president before becoming CEO. He has helped Weather Modification arrange for more than 380 UND pilot internships since 1974 and 62 UND meteorologist internships since 1996, and he was named the 2001 Business Innovator of the Year by the UND Center for Innovation and the 1997 Small Business Exporter of the Year by the North Dakota branch of the U.S. Small Business Administration. ///

—Tom Dennis



**Nominate a UND Aerospace Alum for the 2020 Hall of Fame:**  
 Contact Ken for more information:  
 Ken Polovitz | kenneth.polovitz@UND.edu | 701.777.3561



# UAS DEGREE PROGRAM REACHES 10-YEAR ANNIVERSARY

Ten years ago, nobody knew how long it would be before the commercial potential of unmanned aircraft systems would be unleashed.

That didn't stop UND's John D. Odegard School of Aerospace Sciences from becoming a leader in the field in 2009, by becoming the first university to offer a degree program in UAS operations. It was the start of many firsts in the field of unmanned aircraft for North Dakota.

According to Al Palmer, the retired director of UND's Aerospace UAS program, the University began planning its move into UAS in 2005.

"There was no hesitation about it," Palmer remembered. "Paul Lindseth (current UND Aerospace dean) said at one of our first meetings that we should be running toward this, not walking. UND Aerospace got involved in UAS before anyone could even spell unmanned aircraft systems."

As UND's degree program in UAS operations marks its 10-year anniversary from its start, 225 students have graduated from the University with UAS degrees, and 159 students are currently majoring in the subject. Paul Snyder, director of UND's UAS program, noted that unmanned aviation is on a path to merge with the commercial aviation industry.

"It has been an exciting ride to be a part of such an amazing organization and a group of people who are genuinely dedicated to aviation education, training and research," Snyder said. "We have seen an evolution in which UAS has become more and more prevalent. As it evolves, I believe we will see it converge in many ways with traditional commercial aviation."

## Launching UAS education

In 2006, Ben Trapnell, associate professor of aviation, was given the task of getting ahead of the coming UAS wave by creating an education program for UND

Aerospace. It took three years before everyone was onboard with the program and the State Board of Higher Education gave its approval. The word Trapnell received from industry was that the more future UAS graduates understood about systems engineering, the better.

"We wanted to ensure that our graduates would have the background they needed to be a developmental team member because everything was brand new," he recalled. "We put together a core of four courses, which involved the unmanned aircraft systems, ground systems, communications and telemetry, and remote sensing. We were the first to come up with an unmanned aircraft system operations degree program."

In May 2011, UND graduated its first five students with degrees in UAS operations. All were commercial, instrument-rated pilots, and at least three of them remain employed in the UAS industry. The five graduates were Christopher Burger, Ritzville, Wash.; Jeremy Duke, Everett, Wash.; Adam Julson, Flandreau, S.D.; Alexander Gustafson, Vashon Island, Wash.; and Brett Whalin, Rapid City, S.D.

Trapnell continues to teach students the importance of understanding systems engineering, as well as the aviation engineer's vocabulary. Students also learn to build their own unmanned aircraft.

"The whole idea of the flight course is that students understand how each of the systems within the system work and how they work together," he explained. "It is the idea that UAS are systems of systems, and they must work together seamlessly to be successful."

"Whether you're talking about a large Global Hawk or a small unmanned aircraft like a quadcopter, our students can speak the language and understand the terms when people use them," Trapnell continued. "Companies such as Northrup Grumman, Insitu and General Atomics have very much appreciated the skillsets our



students bring.”

## Commercialization when?

When UND’s first UAS graduates entered the job market, there were questions about when the Federal Aviation Administration (FAA) would allow UAS to fly commercial missions.

“I think the FAA finally got the picture that this wasn’t going to go away,” Palmer said. “The FAA’s primary role is aviation safety, and they do an excellent job there. They wanted to make sure unmanned aircraft were safe, but sometimes you need to break the inertia against change. I think we’ve broken it now.”

Snyder points to UND Aerospace’s successes in forming partnerships with the UAS industry. For example, UND last May signed a memo of understanding with General Atomics Aeronautical Systems Inc., a major UAS manufacturer based in California with operations in Grand Forks.

“This is an example of UAS industry leaders working with UND Aerospace to refine our curriculum and to ensure our students are prepared for future employment,” he said. “Similarly, we have been working closely with Boeing subsidiary Insitu in developing our ScanEagle UAS training. They are actively engaged with us to help our students succeed.”

In addition, Snyder said UND students have opportunities for internships with companies such as General Atomics, Northrop Grumman, U.S. Customs and Border Protection and Insitu.

And, he added, “Other students are moving forward in their UAS careers with local entities such as Isight RPV Services, SkySkopes and the Northern Plains UAS Test Site. We are extremely fortunate to have so many leaders in UAS here North Dakota.”

Snyder emphasized that UND Aerospace has a long history of being engaged in shaping UAS policy and regulations, as well as a reputation for overall excellence in education and research. UND Aerospace was recently named the first ASTM International-certified UAS training facility.

“We have been fortunate to be a part of leading research for the FAA through the Alliance for System Safety of UAS through Research Excellence (ASSURE), as well as other research opportunities with the Air Force Research Lab, Department of Homeland Security, NASA and the Northern Plains UAS Test Site,” Snyder said.

## Evolving UAS curriculum

As the UAS industry changes, UND’s UAS curriculum is evolving to keep pace.

“Last year, we updated our curriculum to include additional courses to help prepare our students for the industry,” Snyder noted. “We added autonomous fundamentals, enabling concepts and counter-UAS courses. We improved courses to include more post-processing and data-collection experience. We also provided students with a choice of two tracks to specialize in the type of UAS operations they intend to pursue.”

One track focuses on medium-sized, high-altitude, long-endurance UAS with training on the Insitu ScanEagle and General Atomics UAS platforms. The second focuses on advanced commercial operations for small UAS with training on the Professional DJI M600 and Insitu ScanEagle platforms. UND Aerospace now also

offers a UAS minor for all non-aviation degree-seeking students.

Another addition to the curriculum is the Simlat UAS Simulation, which enables students to train in simulated environments for such commercial UAS missions as inspecting pipelines, power lines, wind turbines and industrial facilities. Snyder said it gives UAS and commercial aviation students the ability to see how unmanned aircraft are being used to transform the aviation industry.

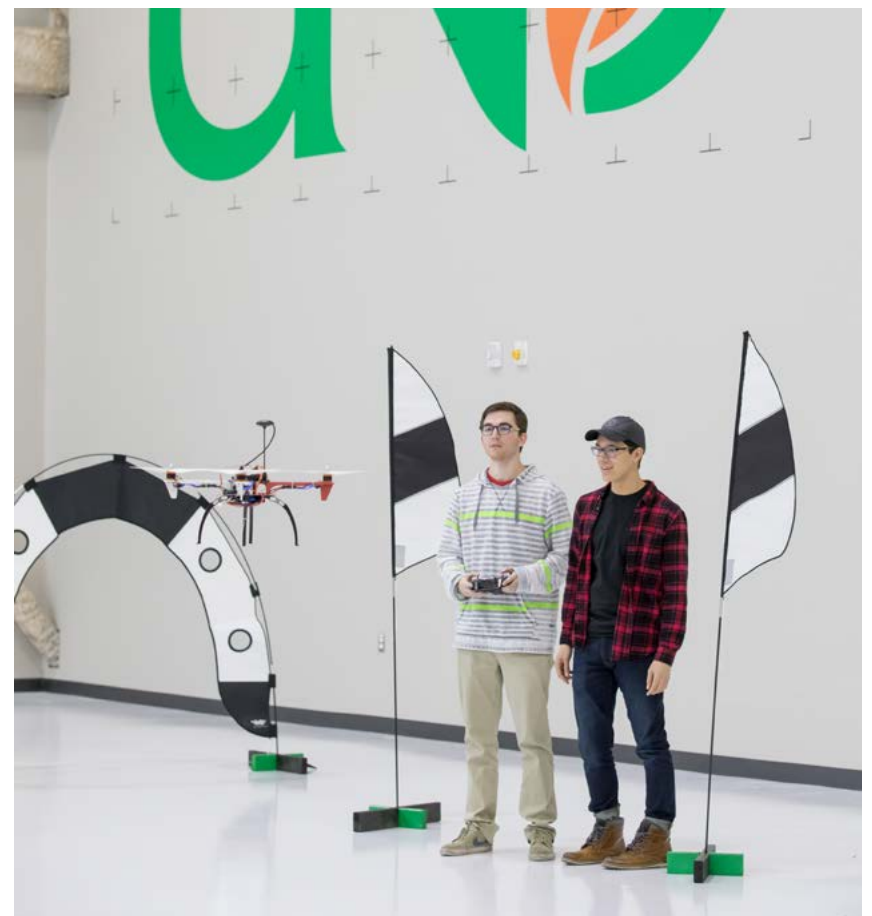
A recent change requires all future UND Aerospace commercial aviation students to take the Introduction to UAS Operations class, which says something of the expected progress of UAS operating in the national airspace system, Snyder said.

“The integration of UAS into the national airspace system is going to happen,” he said. “Equally important, the technology and advancements in autonomous systems we are developing in UAS will make their way to manned aircraft. Students who want to be involved in traditional commercial aviation will need to understand what autonomous fundamentals mean, what issues we have in cyber security and how concepts like data links will be important to all pilots.”

Looking ahead to the next 10 years, Snyder said UND Aerospace will continue to add value for its UAS graduates in an ever-changing market.

“We often tell our students that the jobs of today won’t be the same jobs in four years,” he explained. “Therefore, we need to prepare students to adapt, solve problems and use critical thinking skills.” ///

—Patrick C. Miller / UND Today



# SIMULATORS ON CAMPUS: UND AEROSPACE LAUNCHES VR FLIGHT TRAINER

Odegard School's new Virtual Reality lab represents pilot training's next frontier

When he was being recruited as Associate Dean of the School of Medicine & Health Sciences, Joshua Wynne made fast friends at the University of North Dakota when he said he was a pilot.

More than 15 years ago, he met with Bruce Smith, then dean of the John D. Odegard School of Aerospace Sciences, and found himself sitting in a flight simulator.

Recently, Wynne shared this story in front of a small audience of UND Aerospace faculty and staff at the unveiling of the School's new Virtual Reality Lab in Odegard Hall.

"I managed not to crash," said Wynne, now interim president of the University, to laughs. "It wasn't pretty."

Back then, he was in a version of some of the earliest flight simulation technology. Soon after his remarks, Wynne helped cut the ribbon to what may be the future of flight training.

At the VR Lab's official opening on Jan. 16, both Wynne and incoming President Andrew Armacost were among the first people to hop in the "cockpit" and fly a UND-specific Piper Archer aircraft in virtual space.

"Congrats to the whole team for all of your great work," Armacost said. "The spirit of innovation and finding new ways to increase the rate at which we can train pilots is important for the entire aviation industry."

The VR Lab in Odegard Hall is the result of five years of experimentation and workshopping done by Neil Nowatzki, multimedia specialist, and his colleagues at UND's Aerospace Network.

Nowatzki's first VR simulator station was crafted from plywood in his garage, with joysticks and throttles bolted to it. The four stations in the finished lab still have a minimalist look compared to the full cockpit simulators found in Ryan Hall, but

that's where the immersive properties of VR headsets come into play.

"It's one of those things where you can try to explain it to somebody, but until they actually do it, they don't really get it," said Nowatzki, referring to the experience of wearing a VR headset. "It's like you're actually there."

## Fully immersed

While wearing a headset such as the HTC Vive units found in the VR Lab, users have a full 360-degree view of their simulated environment. Specifically, in the lab, users can see the full cockpit of a Piper Archer single-engine aircraft exactly as it looks a few miles away at UND's Aerospace Flight Operations — instrument gauges and all.

Nowatzki said this capability is best applied to students who are just starting out in their flight courses, establishing situational awareness and the basics of stick and rudder skills.

"We're focusing on teaching the basics of how to fly an airplane," he said. "It's 'eyes outside' in the lab. Students should be able to look out the window and, just by where the nose is, they should know whether they are level or not — are they climbing or descending."

After the ribbon-cutting, both Wynne and Armacost successfully took off, flew and landed in virtual space. Each station has a yoke, throttle and pedals that fully interface with the computer system operating the simulator software and virtual reality headset. Many physical components for each station were custom-crafted by Nowatzki and his team. The lab features larger television monitors above the stations so observers can see through the operator's eyes while in flight.

Even though people such as Wynne and Armacost have perhaps minimal exposure to this technology, the immersive nature of VR makes everything intuitive, said Nowatzki. If you had instead put a video game controller in their hands and told



them to fly and land a plane, the experience most likely would have ended in (simulated) disaster.

“It’s really fun to introduce people to it,” he remarked. “Everyone takes the headset off after a while and they say, ‘I’m in this room. I forgot where I was.’”

“The only thing I can compare it to is introducing people to flying,” Nowatzki said. “Virtual reality produces that same kind of wonder and seeing things from a whole new perspective.”

Associate Dean of Aerospace Beth Bjerke said the demonstrations featuring both presidents showed the potential for VR to intrigue people of all ages when it comes to aviation. With each station being on wheels, UND Aerospace plans to use Nowatzki’s VR flight rigs at air shows, industry events and in all types of engagement opportunities, including the upcoming UND Aerospace Community Day on Feb. 8.

“It doesn’t matter what your age is or your pilot skill level, anyone can enjoy it,” Bjerke said. So far, word of mouth has brought many into the lab to check it out. It’s free for students to use, and they can sign up for flight time just as they would for time on any other training devices in the aerospace school.

### **Clunky — for now**

As Nowatzki has inferred, virtual reality isn’t by any means the “silver bullet” that’s going to replace all flight simulators — at least not in its current iteration.

He likened the current state of VR technology to the first cell phone: big, clunky and weighing five pounds.

Then Nowatzki pulled his smartphone from his pocket.

“Eventually, we’re going to get to this with VR,” he said, pointing to the sleek surface that’s near-ubiquitous in today’s society. “Everyone will be able to have the

VR experience wherever they are, at any time. So what we’re trying to do is build our expertise, so as the platform progresses, we’re able to create content for our students.

“The technology is advancing so quickly, it’s hard to keep up.”

Nowatzki noted that it’s students who will drive the use of VR in flight training and truly determine the direction UND takes it in the future. He credited his student employees for getting the lab to its current, operational state, and Kyle Weller, a sophomore helping manage the lab, joined Nowatzki in cutting the ribbon on UND Aerospace’s newest facility.

What Bjerke imagines in the future is a relatively low-cost capability with VR technology that will require less time in the aircraft for pilots-in-training. Such a development, in turn, would reduce the costs of aviation operations overall. She said UND hopes to partner with other institutions to gather data and develop a case for the FAA, regarding the technology’s legitimacy in flight training — a lengthy process at best.

“Meanwhile, this VR Lab will be great for outreach,” Bjerke said. ///

—Connor Murphy / UND Today

# GRAD, BRETT WHALIN '11 MAKES MOST OF HIS UAS DEGREE

UND Class of 2011: 'When I was hired, it was because they were impressed with my resume'



## UNMANNED AIRCRAFT SYSTEMS

In 2009, UND was the first university of offer a degree in Unmanned Aircraft Systems (UAS) Operations. In 2011, the first UND Aerospace students graduating with a UAS degree were (left to right) Adam Julson, Chris Burger, Brett Whalin, Jeremy Duke and Alex Gustafson. They're shown in May 2011 outside of Clifford Hall with an Insitu Scan Eagle.

Archival Image

In 2011, Brett Whalin was one of the first five students in the United States to graduate with a degree in unmanned aircraft systems (UAS) operations from the University of North Dakota John D. Odegard School of Aerospace Sciences.

When he graduated, Whalin described his decision to pursue a career in the UAS field as "a challenge and a great opportunity." However, the Rapid City, S.D., native was just beginning to learn true the nature of the challenge. Although UND Aerospace had decades of experience in training pilots for commercial aviation, the UAS industry was still in its infancy, and opportunities were limited.

Whalin recalled that his career choice was something of a risk because of uncertainty about when the Federal Aviation Administration (FAA) would allow UAS to fly commercial missions in the national airspace. It took more than five years

before the FAA finalized its Part 107 regulations, enabling small unmanned aircraft to fly commercial missions under an altitude of 400 feet and within line of sight of the UAS operator.

"This cracked open the potential for U.S. jobs, but still only in a limited way," Whalin said. "I think the FAA still has much work in this respect, compared to its foreign counterparts. The U.S. market is growing, but is still limited."

Whalin has worked in the UAS industry since April 2012, primarily with military customers as a UAS pilot flying missions overseas and maintaining unmanned aircraft. He's also instructed other civilians flying UAS missions for the military. It was a career path with its own challenges because most new college graduates don't have the security clearances needed to work with the military.

## A 'guinea pig'

"When I finally got to do some work, it was with BOSH Global Services," Whalin said. "They exclusively hired veterans. When I was hired, it was because they were impressed with my resume, but they also wanted to expand their knowledge base. I was told when I was hired that I was the guinea pig to see if they wanted to continue to hire any more civilians."

Whalin did well at BOSH (now part of MAG Aerospace), which is based in Newport News, Va. In 2013, he received the company's Vice President of Operations Service Award. He was with BOSH for nearly three years, sometimes working in what he described as "austere locations overseas."

In May 2015, Whalin went to work for Insitu Inc., a subsidiary of Boeing, where he held the positions of UAS operator, maintainer and field trainer. After three years at Insitu, Whalin joined Academi, a global training and logistics management company headquartered in Reston, Va. He worked overseas as a UAS pilot and maintainer.

Whalin recently accepted a position with Arcturus UAV in Rohnert Park, Calif., where he is a subject matter expert. The company manufactures and configures UAS, ground control stations and launch systems.

## UND's aviation professionalism

"Companies now see the merit of someone with an aviation engineering/flight background, and are more willing to sink in the money – if the candidate looks promising," Whalin said. "I think this is a direct result of how UND molded us and our aviation professionalism."

He believes the high standard of professionalism achieved by UND's first wave of UAS graduates has helped pave the way for those who followed.

In the following Q&A, Whalin discusses with UND Today the role his education at the University has played in his UAS career.

## How has your UND degree in UAS operations helped you achieve your career goals?

My experience at UND has helped me in many ways toward being able to distinguish myself. My aviation knowledge has helped me save many aircraft from emergencies, as well as keep a cool head to help others during their in-flight emergencies. UND taught me remote sensing and telemetry. I understand how the cameras actually work, versus just knowing their settings. My knowledge of radio wave propagation has also helped me troubleshoot, get out of or mitigate jamming while on the job, in ways that weren't as obvious to some of my co-workers.

Lastly but most importantly, the multiple cultures represented in UND's aviation school opened me up to more of the world than some get, which, in my traveling job, makes all the difference.

## What advice would you give to a young person interested in pursuing a career in the UAS industry today?

My best advice is to become a manned pilot. It will give you so many advantages such as knowledge, professionalism via crew resource management (CRM) and decision making. Not to mention, it is a great way to spend a sunny weekend.

The other thing is to learn networking. It's the backbone of what we do. Our radios

are a network. We get to our customer via networks. All of our equipment is based on computers, so learning how they talk is important. Knowing how to build cables for both networking or power becomes critical on site when a backhoe runs over your ethernet or fiber cable. You have to either replace or fix it. Best Buy is not an option in places like Afghanistan.

## What have been some of your best experiences while working in the UAS industry?

Some of the best experiences I have had in this industry are related to the impacts my co-workers and I have had. Overseas, we have ensured troops came home. In the states, we have saved houses from fires and kept fire department personnel safe. These people rarely meet us, but seeing their house standing or their military vehicle returning to the base, is a perspective that all UAS professionals should have. ///

## WHERE DO YOU SEE THE UAS INDUSTRY HEADED IN THE NEXT 5 TO 10 YEARS?

In the short-term, VTOL (vertical takeoff and landing) is definitely going to take over more and more of the UAS market. Drone swarms are also going to become more popular. Several companies have proven the viability of commercial UAS enterprises in the U.S. While still highly expensive, they do show the need and use of medium-endurance UAS options. On a smaller scale, the real estate market has been using small UAS for a while now. Cloud and software-defined networking are also going to start affecting the field in big ways.

While the U.S. market is very small at the moment – compared to what I see it becoming – the pressure is building. Part 107 was able to finally let some of that pressure manifest itself into jobs in the U.S., but the FAA still lags behind its foreign counterparts. As unmanned aviation becomes more regulated and integrated into the manned aviation network, the market will truly take off. To get ahead when those days come, one must adapt to being an engineer and being able to either design or build a UAS. Both take different, complimentary talents. Pilots who are computer savvy and have technical knowledge – similar to what UND has given me – will be even more viable in those jobs.

—Patrick C. Miller / UND Today

# ON THE HORIZON



## Doppler on Wheels (DOW)

The Center for Severe Weather Research (CSWR) Doppler on Wheels (DOW) is visiting the UND Dept. of Atmospheric Sciences for an educational field campaign to study snow and blizzard events from January 20th - February 10th. This truck has gone all over the world to study hazardous weather events such as hurricanes and tornadoes. Graduate and undergraduate students are learning how to operate the truck and use its sensitive radar to collect data. Besides being in the field, the DOW is visiting schools in the region.

## Alum Aviation Family Reunion

Captain Duane Amann ('81) on his retirement flight from Southwest Airlines with his son, Dustin Amann ('03), as his First Officer. Dustin's wife Anna (Hollerung) Amann ('03) is an Air Traffic Controller at Fort Worth Center.



## Lydia Blume '18

Fargo-based weather forecaster Lydia Blume credits UND for helping her realize her childhood dream career. "I didn't look at any other schools," Blume said. "I fell in love with the campus. I fell in love with the faculty, the staff. I fell in love with everything about the university."

University of North Dakota  
is developing the future.



BRAD LINDOW '05



[nbaa.org/40u40](http://nbaa.org/40u40)



### Matt Enerson '00

Six years ago, University of North Dakota alum and former UND CFI Matt Enerson (ENER) taxied onto Bravo ramp in a SEMI for the last time. He returned to UND as Lt. Enerson with the U.S. Navy and taxied onto Bravo ramp in a F-18 on September 20, 2019. Thank you for stopping and visiting with our students Lt. Enerson.



### Space Force

Gen. John Raymond made his first public visit since the formation of the U.S. Space Force at the invitation of Sen. Kevin Cramer



### UND Aerospace UAS Training Gets Seal of Approval

As the first university approved to meet ASTM International for training students in unmanned aircraft systems (UAS), the UND John D. Odegard School of Aerospace Sciences is planning to extend this expertise beyond the campus.

# UPCOMING EVENTS

## MARCH

Women in Aviation Alumni & Industry Reception  
6 | Lake Buena Vista, Fla.

## APRIL

SAMA Conference & Career Fair  
16-17 | Grand Forks, N.D.  
Family Weekend  
18 | The Betty, Grand Forks, N.D.

## MAY

Spring Commencement  
16 | Grand Forks, N.D.

## JUNE

Air Race Classic Start  
19-23 | Grand Forks, N.D.

## JULY

EAA AirVenture  
20-26 | Oshkosh Wisc.  
Alumni & Industry Reception  
22 | Hilton Garden Inn, Oshkosh Wisc.

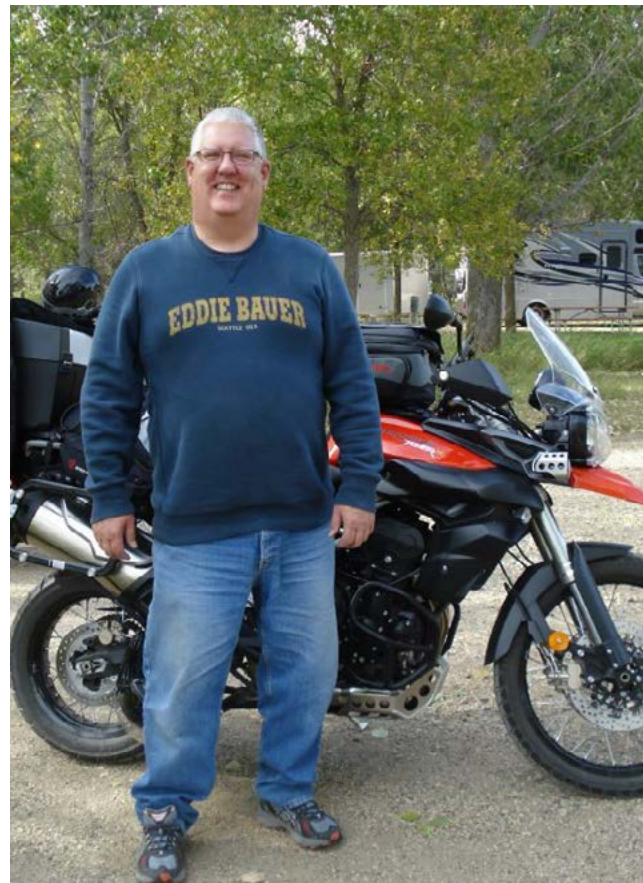




### Space Talk

The North Dakota Space Grant Consortium hosted a live downlink with NASA astronaut Christian Koch, currently aboard the International Space Station, on Aug. 19.

<https://youtu.be/JJ6pKDrAp0g>



### Congratulations, Kent!

UND Aerospace lead CRJ flight instructor retires after 43 years. Kent began his tenure on October 16, 1976 as a flight instructor. He was promoted to a pilot II in 1980 and was the chief pilot for air service flying the Citation Jet for many years. He has spent the last 17 years as a lead CRJ flight instructor at Ryan Hall. Kent has a Bachelor's degree in Aviation Administration from UND. He also holds an Air Transport Pilot Certificate with Cessna Citation, Canadair Regional Jet and RA390 S Premier Jet Single Pilot type ratings.

During his career, Kent has been all over the world, literally. His travels have taken him to Kwajalein, Puerto Rico and Alaska just to name a few.

In the last 20 years alone, Kent has taught more than 1,800 students, and logged over 13,000 hours of instructing time!



# AEROSTOP

YOUR UND AEROSPACE MERCHANDISE HEADQUARTERS

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FRENCH VANILLA CAPPUCCINO





### Air Traffic Control hiring reform: What it means for UND

Buried inside the nearly 2,000 pages of the recently passed National Defense Authorization Act is a provision that's a big win for UND.

The provision, which resulted in part from the efforts of Sen. John Hoeven, R-N.D., directs the Federal Aviation Administration to give preference to graduates of collegiate air traffic management programs such as UND's in the hiring of federal air traffic controllers.

And as word of the changes gets out, more students are likely to enroll in the program, UND administrators say.

"The ATC Hiring Reform Act is important for UND Aerospace and its ATC graduates," said Hoeven after the legislation's approval. "The University of North Dakota is a premier aviation and aerospace university, and one of the FAA's Collegiate Training Initiative (CTI) programs. Given our nation's shortage of air traffic controllers, it only makes sense that the FAA hire graduates of UND and other CTI schools, as well as veterans, to help meet our nation's needs."

As the aviation industry faces shortages, the preference for well-qualified candidates comes at a crucial time. UND has been a leader in training air traffic controllers for nearly 30 years.

After a five-year slump in Air Traffic Management — where enrollment went from a stable 350 majors to a mere 90 — Drechsel said the 2020 numbers already are trending upward.

"Our classes are filling up," said Drechsel, implying that additional sections will be added to sophomore-level ATC courses with the expectation to follow through junior and senior-level courses. "We'll always make room."

—Connor Murphy / UND Today



# AIR RACE CLASSIC 2020 IT STARTS HERE.





### AARON KENNEDY

UND associate professor of atmospheric sciences, braves subzero temperatures to perform maintenance on weather instruments at the Oakville Field Station west of Grand Forks, N.D.

Photo By: Patrick C. Miller/UND Today

# BUILDING A BETTER FORECAST IN 'BLIZZARD ALLEY'

UND Atmospheric Scientist Aaron Kennedy seeks answers to the chilling mysteries of winter storms

It's that time of year on the Northern Plains when weather forecasters predict winter storms and the public turns a critical eye toward the accuracy of the forecasts.

Did it snow more or less than predicted? Was it windier or less windy than forecast? Were travel conditions better or worse than expected?

"I tell my students to be thankful for being a meteorologist or climatologist because there's no way around it: weather and climate impact people," said Aaron Kennedy, associate professor of atmospheric sciences at the University of North Dakota. "I think everyone who lives in the region has probably experienced a blizzard and has a story about how the forecast got it wrong. I want to figure out why we're wrong sometimes and how we can improve future forecasts."

To help find these answers, Kennedy conducts research on winter weather and climate. His work is funded by the North Dakota EPSCoR (Established Program to Stimulate Competitive Research) and the National Science Foundation (NSF), among other organizations and agencies. He is the co-lead for EPSCoR's Center for

Regional Climate Studies (CRCS) with Jianglong Zhang, UND associate professor in atmospheric sciences.

### North Dakota benefits

Through CRCS, Kennedy and other researchers around North Dakota study how global climate impacts regional weather, extreme weather events and agricultural productivity. Computer modeling and simulations help scientists understand how global climate impacts North Dakota agriculture in the areas of field hydrology, general land use, biomass production and human behavior.

Kennedy collaborates with the National Weather Service (NWS) office in Grand Forks, just west of the UND campus, where a number of the University's atmospheric science graduates work.

"Through EPSCoR, we partnered with the weather service to publish a climatology of blizzards," he explained. "We formally documented when blizzards occur and the type of patterns they have, and we demonstrated how we could use basic

## AARON KENNEDY

Through North Dakota, EPSCoR and the Center for Regional Climate Studies, Kennedy and other researchers around the state study weather and climate trends.

Photo By: Patrick C. Miller/UND Today



computer algorithms to separate different types of patterns. The problem is that we have minimal data to actually validate whether the models are performing correctly.”

When it comes to modeling and simulating winter storms, Kennedy believes there are many questions CRCS researchers can help answer. For example, the effects of blowing snow aren’t factored into the models used to simulate winter storms, he said.

“The amount of work being done with high-resolution weather modeling in winter is minimal,” he said. “That’s really a frontier that hasn’t been investigated. We don’t have a true understanding of how well these models simulate the wintertime environment.

“It’s a very challenging environment because in the lowest layer of the atmosphere where blizzards occur – the boundary layer – there are very few observations about what’s happening,”

### Where’s the blizzard?

This is primarily because the curvature of the earth limits weather radar from seeing conditions at the surface the further away those conditions are from the radar antenna. Kennedy has satellite photos and images taken from the SkyCam high atop UND’s Clifford Hall showing ground blizzard conditions in the Thief River Falls, Minn., area that weren’t visible on the NWS weather radar in Mayville, N.D.

“We had part of the Red River Valley with no blowing snow and another part with blizzard conditions,” he said. “I looked at some of the model output for that day. None of the models had the right answer. They don’t include the process of blowing snow. Even the wind field didn’t match what was observed. We’ve got our work cut out for us.”

Kennedy is studying such factors as how blowing snow impacts the weather, how the ability to forecast ground blizzards can be improved, how winter storms can be modeled more accurately, how snowflake structure affects snowfall amounts, how land use impacts the weather and how temperature and precipitation trends are changing.

For those who study extreme winter weather events, Kennedy said there’s no place like the Red River Valley in eastern North Dakota and western Minnesota.

“If we look at all the reported blizzard events in the contiguous 48 states, the Red River Valley is the peak in the nation for non-mountainous areas,” he explained. “It’s a combination of factors. One is that we get a variety of systems that cause blizzards. We get big Colorado low-pressure events, and we get Alberta Clipper systems that come out of Canada. We also get systems that are somewhere in between.

“In addition, land cover with a lack of trees promotes strong winds.”

### Looking ahead

This is important in forecasting North Dakota’s weather and long-term climate trends because the state’s precipitation events are driven by large-scale weather patterns, according to Kennedy.

“One of the biggest debates in the scientific community right now is whether these large-scale weather patterns are changing,” he said. “What people should focus on is how often the temperature is above or below average, because if that’s changing, it becomes the actual climate trend.

“In North Dakota, for example, the probability of us setting a record low temperature has gone down, at least during the wintertime. We’ve seen a slight increase in days where the temperature is above freezing in the middle of winter.”

Kennedy also noted CRCS research through EPSCoR showing that maximum summertime temperatures in North Dakota aren’t going up as much as expected.

“The climate models show us getting warmer in the summer than we’re actually getting,” he explained. “This could be because the models don’t adequately consider the land surface in an area dominated by agriculture. We’ve seen a transition from grains to soy beans and corn. Those plants are much more effective at moving water back and forth between the atmosphere and the land surface.”

Kennedy said that through EPSCoR, proposals are being submitted for more collaborative research with entities such as the National Oceanic and Atmospheric Administration (NOAA). He sees that work leading to the creation of apps the public can use for better forecasts of ground blizzards and other severe weather events.

“There’s always going to be some uncertainty in forecasting weather,” Kennedy noted. “Conveying the uncertainty is where most of our progress needs to be made. This information will hopefully help people make better decisions.” ///

—Patrick C. Miller / UND Today

CATHY FINELY

# A NEW PARADIGM FOR FORECASTING TORNADOES

UND atmospheric scientist Catherine Finley collaborates on groundbreaking tornado research



## CATHY FINELY

was a founding member of the TWISTEX tornado chasing project. She is shown with mesonet instruments attached to a car used to collect weather data near tornadoes.



What we think we know about how and why tornadoes form could be wrong.

Catherine Finley, assistant professor of atmospheric sciences at UND, is collaborating on a National Science Foundation (NSF) project with Leigh Orf, associate scientist with the Space Science and Engineering Center at the University of Wisconsin in Madison, and Bruce Lee, managing atmospheric scientist of High Impact Weather Research & Consulting LLC. They're using an atmospheric model run on a supercomputer to simulate supercell thunderstorms that typically spawn the strongest, largest, longest-lasting and most deadly tornadoes.

Given that roughly three-quarters of the tornado warnings issued by the National Weather Service are false alarms, the ability to recognize and detect signs in the atmosphere leading to the formation of a tornado could result in more reliable and longer advance warnings — warnings that save lives.

**“This work is really groundbreaking because when you’re out in the field — and I’ve actually done some observational research in tornadoes and severe storms — almost always prior to tornado genesis, you see the development of what we call the rear-flank downdraft,”**

**CATHY FINELY, ASSISTANT PROFESSOR**

Those who watch TV shows or YouTube videos about tornadoes and storm chasing

have likely heard references to rear-flank downdraft or RFD, a phenomenon that produces strong winds on the back side of a tornado. For that reason, it's an area storm chasers usually try to avoid.

### Tornado genesis

“People thought that RFD was a crucial part of the tornado-genesis process, and it still may be,” Finley said. “We’ve understood for a long time that the main spin of the supercell comes from the environmental wind shear, but nobody fully understands where the spin comes from that feeds the tornado.”

Orf's pioneering work in computer modeling offers some promise in solving the problem, although he and Finley both admit they're a long way from a definitive answer.

“What this research is showing is that maybe we should be focusing more on the forward flank of the storm,” Finley explained. “It could actually change our whole paradigm of the tornado-genesis process.”

Before coming to UND in January, Finley studied tornado genesis at St. Louis University in Missouri. She intended to analyze the RFD on a computerized simulation based on an Oklahoma tornado when her graduate student asked, “What downdraft?” The simulation had produced a tornado with no RFD near the surface.

“We started questioning what was actually going on and ran several different scenarios,” Finley recalled. “The nice thing about models is you can change things a little bit and see what effect it has.”

The question the research group is now trying to answer is: what causes the air to spin faster at low levels where tornadoes form? Their theory is that a sudden drop in pressure is drawing in and concentrating the vorticity — the rotating wind — associated with the storm. This vorticity is then stretched by a strong low-level updraft that significantly speeds up rotation.

The group's model show spinning vortices, sometimes invisible to the human eye, being drawn in to form what becomes the tornado funnel.

“The RFD may not be the cause of the tornado; it may be an effect,” Finley said. “We have an alternate theory for the specific type of storm we're studying. We are arguing that it has more to do with the forward flank and the streamwise vorticity current (a spiraling inflow of air). It's the pressure drop.”

### Supercell simulations

Orf has spent a decade using his coding skills to modify a computer model to run on the Blue Waters Supercomputer at the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign. The model was originally developed by George Bryan at the National Center for Atmospheric Research. Finley did the groundwork and initial model simulations of the April 27, 2011, tornado in Tuscaloosa, Ala., one of the storms from the exceptionally destructive super outbreak of that week. Finley's work included finding a realistic and representative atmospheric sounding from the National Weather Service that would produce a tornado in the model.

In addition to the group's internal validation work, Orf has been working for the past two years with Hank Schyma, aka Pecos Hank, a Houston-based storm chaser with more than 20 years of experience. Schyma's high-quality videos of supercells and tornadoes enable Orf to directly compare his models with what Schyma has experienced in real life. They recently posted a YouTube video making side-by-side



comparisons of their work.

“Honestly, it helps me understand whether the model is doing the right thing or not,” Orf explained. “If it looks like a dead-ringer for a real storm, then I know the model itself isn’t creating some bizarre, unreal thing. It’s what’s really going on inside a storm.”

Schyma remembered the first time he watched a video showing one of Orf’s computer simulations.

“I was astonished by how accurate and beautiful they were,” he said. “I thought they were Hollywood creations based on observations. I didn’t realize that a supercomputer grew them, not a human. I’m learning a lot from watching these simulations.”

Finley noted that what’s not seen is the number of times the models don’t produce the expected results from the data entered into them.

“We have failures all the time,” she admitted. But when a simulation parallels a real storm? “You start cheering and telling all your friends, ‘Look at this! Look at this!’ It’s really exciting.”

Although Schyma isn’t a scientist, he believes that Finley and Orf are on the right path to unlocking the secrets of supercells that form tornadoes.

“I’m ready to say this is an accurate proxy to Mother Nature, and we need more of these simulations,” Schyma said. “I think this is the most powerful tool that we have right now to help us understand these supercells.”

### **The early years**

Finley grew up in Benson, Minn., where her father was one of the first spotters for the National Weather Service Sky Warn program. Always interested in weather and encouraged by her parents to pursue meteorology, she spotted her first tornado at the age of 12. She continues to chase storms, understanding that it’s important to see what happens in nature.

She also knows all too well the risks associated with storm chasing. On May 23,

2008, near Quinter, Kan., Finley and Lee were in a car equipped with instruments to take measurements as science directors of a tornado research program known as TWISTEX (Tactical Weather-Instrumented Sampling in/near Tornadoes Experiment). They thought they were in a safe location to observe a tornado, but within a minute, all that changed.

“That’s the only time I’ve been actually scared when we were out in the field,” she said. “We came very close to getting hit by the edge of the tornado.”

The tornado quickly grew to a mile wide and unexpectedly turned toward them. A 108-mile-per-hour wind gust blew the car off the road and into a ditch, and toppled nearby power lines. There was no time to escape. On her office computer, Finley showed a video taken from a distance by another storm chaser. The edge of the tornado narrowly misses the car. Amazingly, Finley and Lee escaped without injury.

As founding members of TWISTEX, Finley and Lee knew project leader Tim Samaras well. His storm-chasing exploits and research have been featured on National Geographic and the Discovery Channel TV shows. On May 31, 2013, Samaras, his son Paul and chaser Carl Young lost their lives while chasing a tornado near El Reno, Okla. The largest tornado ever recorded made an unexpected turn.

“People in the El Reno event described the same thing that we experienced,” Finley noted. “They thought they were at a safe distance and, all of a sudden, it seemed like the tornado was right next to them.”

Eight were killed by the El Reno tornado, all of them in vehicles. But Finley knows that to better understand tornadoes — however dangerous the storms can be — she needs to chase them and observe them, as well as model them.

“To me, there’s something interesting and spiritual about it — just watching Mother Nature produce a storm and produce a tornado,” Finley said. “And every time you go out, you learn something, you see something interesting. Modeling is great, but you need to look at the real world to see if your models are looking like the real world looks.” ///

—Patrick C. Miller / UND Today

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### **PABLO DE LEÓN, SENATOR CRAMER & JIM BRIDENSTINE**

At the NASA-funded Inflatable Mars/Lunar Habitat, Jim Bridenstine (right) and Sen. Kevin Cramer (center) are greeted by a student wearing a space suit designed by Pablo de León (left), head of the UND Human Spaceflight Laboratory.





# UND POSITIONED FOR FUTURE SPACE EXPLORATION

## NASA Administrator Jim Bridenstine lauds University's aerospace research

In a visit to UND recently, NASA Administrator Jim Bridenstine commended the work being done at the John D. Odegard School of Aerospace Sciences and called its research “second to none.”

“The University of North Dakota is delivering — on behalf of NASA — technology that is helping us understand the earth, helping us understand the earth's atmosphere, helping us better predict weather events and the climate,” Bridenstine said. “Beyond that, the University of North Dakota is helping us with human space flight.”

Following meetings with UND faculty and students and a tour of the aerospace school's facilities, Bridenstine said, “What happens here enables us to do more than ever before. UND will be part of NASA's future space exploration efforts.”

### Uber to the moon

During his visit, Bridenstine explained his plan to move human space exploration missions to the moon and Mars forward by ending NASA's practice of purchasing and owning hardware. Instead, the agency will buy services from private companies that collaborate with universities such as UND. He compared it to hiring an Uber for a trip to the moon.

“We want to encourage universities to do what they're good at doing — providing basic research to the private companies we will contract with,” he said. “What's unique about university settings is that you can get scientists and engineers in the same room to collaborate in real-time in ways that don't happen in industry — you don't get an optimized solution. “

U.S. Sen. Kevin Cramer, R-N.D., arranged for Bridenstine's visit to UND and accompanied him on the visit. Cramer said he and Bridenstine, who's from Oklahoma, became friends when they were both elected to the U.S. House in 2012. They were cubicle neighbors before being assigned offices and also served for a time together on the House Committee on Science, Space and Technology.

“When Jim was appointed NASA administrator last year, I couldn't have been more delighted,” Cramer said.

### UND's bench of talent

A former U.S. Navy pilot, Bridenstine noted that some pilots he flew with were graduates of UND's aerospace school. He said universities provide NASA with “a wealth of knowledge” and students who are “a bench of talent for decades.” He also recognized UND's efforts to help deal with the global shortage of pilots by providing aviation training for students “who are ready to go on Day One.”

During a breakfast in Robin Hall, Bridenstine was welcomed to UND by President Joshua Wynne, Tom DiLorenzo, provost and vice president for academic affairs, and Paul Lindseth, dean of the aerospace school. Aerospace faculty members

presented briefings on space studies and atmospheric sciences projects at UND related to ongoing NASA programs, as well as NASA-funded EPSCOR grants and a STEM outreach program for K-12 students.

When Bridenstine asked about UND's ability to collaborate with industry, DiLorenzo noted that the University had just this week signed an agreement with the North Dakota Department of Commerce and the Bank of North Dakota that will assist in commercializing research. He said this provides the UND with a flexible policy to commercialize intellectual property.

“That's fantastic,” Bridenstine replied.

### NASA connections

A tour of UND aerospace facilities included unmanned aircraft systems (UAS) active learning, aircraft and spacecraft simulators, the Inflatable Mars/Lunar Habitat (IMLH), the altitude chamber, the atmospherium, the Human Spaceflight Lab, the NASA Space Grant office and air traffic control simulators.

During a town hall meeting in Clifford Hall, faculty and students asked Bridenstine questions about topics such as how NASA plans to handle human factors related to deep space exploration and how it plans to avoid lapses in funding that have caused decades of pauses between manned space flights. Bridenstine cited UND's Inflatable Mars/Lunar Habitat and space suit designs as examples of research that will assist NASA with solving issues related to deep-space missions that will last years. The moon, he explained, will serve as the proving ground for missions to Mars.

“We want to be able to have sustainability on the moon with the purpose of learning how to live and work on another world and then go to Mars. That Mars analog (IMLH) that's being done here at the University of North Dakota is going to be critical for us in the future.”

Bridenstine also noted the importance to NASA of space suits being designed by Pablo DeLeon, who heads the UND Human Spaceflight Laboratory.

“One of the amazing capabilities here is the space suits,” Bridenstine said, describing how they enable astronauts to live and work in the vacuum of space in high-radiation environments and extreme temperatures. “Now, because of the good work of the University of North Dakota, we're going to have some capabilities and technologies that enable us to walk on another world. They are amazingly complex space suits; every space suit is a space ship.” //

—Patrick C. Miller / UND Today



# NORTH DAKOTA YOUTH REACHING NEW HEIGHTS

Near-Space Balloon Challenge hosts middle and high school student teams at UND to send experiments miles above Earth

It can't be snowing. It can't be too windy. Ideally, it shouldn't even be cold, because freezing temperatures complicate things, too.

To launch a weather balloon, conditions need to be right, in other words. That means making the launch in North Dakota in the middle of November is a dicey proposition at best.

And when close to 100 students from around the state are descending on campus to see their weeks and months of hard work — in the form of balloon payloads — ascend through the Earth's atmosphere, that pumps up the pressure on organizers, too.

But on the weekend of Nov. 22 and 23, sunshine, a breeze and above-zero temperatures meant it was “all systems go” for the Near-Space Balloon Challenge, whose coordinators, UND graduate students and middle and high school students worked together to launch a variety of experiments.

Hosted by the University of North Dakota-based North Dakota Space Grant Consortium (NDSGC), the ballooning challenge funds teams across the state to design, build and present experiments on campus before launching payloads miles above the planet's surface.

Two balloons launched near Robin Hall on Nov. 23 reached as high as 86,000 feet before popping and sprouting bright pink parachutes to aid their stringed payloads' descent. The two sets were found close to Gary, Minn. — more than an hour's drive

from the launch site.

Last year, the challenge recognized the 60th anniversary of NASA — the federal agency that funds all 50 states' (plus the District of Columbia and Puerto Rico) space grant consortia.

“This year's theme is the 50th anniversary of the moon landing — the Apollo 11 mission,” said Steven Russell, a space studies graduate student from the Twin Cities. “A secondary theme is the new generation of space scientists, space exploration and the Artemis program.”

Considered a sister program to the Apollo missions of the 20th century, Artemis is the 21st century effort by NASA and international partners to send people back to the Moon, and next to Mars.

“So, some groups are looking into how microbes grow in space and how plants grow in space,” Russell continued. “These things are critical to future exploration missions.”

In the words of Marissa Saad, NDSGC coordinator, “it's Moon-themed, past and future.”

Groups from the nine communities that met the balloon challenge comprised a wide age range, from sixth graders to high school seniors, as happens most years.



So, the project's themes are more about inspiration than strict direction.

Minutes before the morning launches on Nov. 23, a couple of students from the Langdon, N.D., team described what they would be sending to the near-stratosphere .

"Our primary goal is to test how food and fluids will handle a near-space environment," Langdon Area High School sophomore Alex Brinegar said.

The team would be launching test tubes filled with water, with each water sample holding a different level of salt.

Using a microcomputer called a Raspberry Pi, the team also had assembled a system of sensors capable of measuring temperatures across the assortment of test tubes.

"We'll measure how cold each will get and whether it will freeze," Brinegar said. "We'll also test on the ground to see if at that temperature, it would freeze."

Brinegar and senior Seth Franchuk said it was their first time participating in the challenge, and they appreciated the support of NDSGC to build what they wanted to test.

"[The challenge] allows us to do a lot more," Franchuk said.

Space Grant's outreach effort through the challenge covers travel, lodging and other expenses for all of the participating schools every year. Teams are also reimbursed for their payload construction costs.

"Anything STEM [science, technology, engineering and math] is in demand not just by administrators, but also teachers," said Saad. When educators realize participating in the challenge doesn't require many, if any, out-of-pocket expenditures, they're eager to recruit interested students.

"Not being from North Dakota, I'm always impressed by how teams are driving hours and teachers are volunteering their time to be here," Saad added.

Saad, with a NASA-stickered megaphone at the ready, led two lines of "payload captains" to the launch site just beyond Robin Hall's parking lot. Students such as Franchuk held their schools' experiments as the payload line, beginning with the parachute, was attached to the balloon.

"FIVE, FOUR, THREE, TWO, ONE," the crowd chanted shortly after.

For this NASA crew, the countdown wasn't followed by the raucous roar of an engine or the boom of a booster. But there were certainly cheers as the first balloon flew southeast into sunny skies.

The payload captains on the second balloon followed suit – holding their boxes out as if in offering. Since they were aligned with the wind's direction, the balloon simply lifted the packages from their hands after the second count.

Marci Johnson was nearby with a camera in-hand. Johnson teaches physics and chemistry at Shiloh Christian School in Bismarck, N.D., and has brought groups to UND for the past five years.

"I love seeing them get excited about things," Johnson said of her student team and their experience at UND. "At the launch, I was taking pictures of their faces as the balloons were released. That's what keeps me coming back."

After watching their payloads float away into the blue, students toured around UND's aerospace buildings to see the Arthur P. Anderson Atmospherium, the Human Spaceflight Laboratory and perspectives from space through Virtual Reality headsets. ///

—Connor Murphy / UND Today

**DECADE IN REVIEW | 2010-2019**



2,342 Bachelors  
345 Masters  
25 Doctorate



3,597 private pilot certificates  
2,883 commercial pilot certificates  
884 flight instructor certificates  
714 flight instructor-instrument  
certificates



**1,074,739**

total flight hours

**1,000+**

flight instructors hired



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